

CLAIMS:

1. A method of making a steel strip by continuous casting comprising the steps of:

- a. assembling a pair of cooled casting rolls having a nip between them and with confining closures adjacent the ends of the nip;
- b. introducing molten low carbon steel having a total oxygen content of at least 100 ppm and a free oxygen content between 30 and 50 ppm between the pair of casting rolls to form a casting pool between the casting rolls;
- c. counter rotating the casting rolls and solidifying the molten steel to form metal shells on the surfaces of the casting rolls with levels of oxide inclusions reflected by the total oxygen content of the molten steel to promote the formation of thin steel strip; and
- d. forming solidified thin steel strip through the nip between the casting rolls from said solidified shells.

2. The method of making steel strip as claimed in Claim 1 wherein the molten steel in the casting pool has carbon content in the range of 0.001% to 0.1% by weight, a manganese content in the range of 0.01% to 2.0% by weight, and a silicon content in the range of 0.01% to 10% by weight.

3. The method of making steel strip as claimed in Claim 2 wherein the molten steel in the casting pool has an aluminum content on the order of 0.01% or less by weight.

4. The method of making steel strip as claimed in Claim 2 wherein: the molten steel in the casting pool has an oxygen content between 100 ppm and 250 ppm.

5. The method of making steel strip as claimed in Claim 1 wherein: the molten steel in the casting pool has an oxygen

content between 100 ppm and 250 ppm.

6. The method of making steel strip as claimed in Claim 1 wherein the molten steel contains oxide inclusions comprising any one or more of MnO, SiO₂ and Al₂O₃ distributed through the steel at an inclusion density in the range 2 gm/cm³ to 4 gm/cm³.

7. The method of making steel strip as claimed in Claim 1 wherein more than a majority of the inclusions range in size between 2 and 12 microns.

8. The method of making steel strip as claimed in Claim 1 wherein the sulphur content of the molten steel is less than 0.01% by weight.

9. The method of making steel strip as claimed in Claim 1 comprising the additional steps of:

e. refining the molten steel prior to forming the casting pool by heating a steel charge and slag forming material to form molten steel covered by a slag containing silicon, manganese and calcium oxides,

f. stirring the molten steel by injecting an inert gas into molten steel to cause desulphurization, and thereafter

g. injecting oxygen to produce molten steel having the total oxygen content of greater than 100 ppm and a free oxygen content between 30 and 50 ppm.

10. The method of making steel strip as claimed in Claim 9 wherein the desulphurization reduces the sulphur content of the molten steel to less than 0.01% by weight.

11. The method of making a thin steel strip as claimed in Claim 9 wherein the solidified steel is a silicon/manganese killed steel and the inclusions comprise any one or more of MnO, SiO₂ and Al₂O₃.

12. The method of making a thin steel strip as claimed in Claim 9 wherein more than a majority of the inclusions range in size between 2 and 12 microns.

13. The method of making a steel strip as claimed in
5 Claim 9 wherein the solidified steel has a total oxygen content in the range of 100 ppm to 250 ppm.

14. A method of making a steel strip by continuous casting comprising the steps of:

- 10 a. assembling a pair of cooled casting rolls having a nip between them and with confining closures adjacent the ends of the nip;
- b. introducing molten low carbon steel having a total oxygen content of at least 70 ppm and a
15 free oxygen content between 20 and 60 ppm between the pair of casting rolls to form a casting pool between the casting rolls;
- c. counter rotating the casting rolls and solidifying the molten steel to form metal
20 shells on the surfaces of the casting rolls with levels of oxide inclusions reflected by the total oxygen content of the molten steel to promote the formation of thin steel strip; and
- d. forming solidified thin steel strip through the nip between the casting rolls from said
25 solidified shells.

15. The method of making steel strip as claimed in Claim 14 wherein the molten steel in the casting pool has carbon content in the range of 0.001% to 0.1% by weight, a manganese content in the range of 0.01% to 2.0% by weight, and a silicon
30 content in the range of 0.01% to 10% by weight.

16. The method of making steel strip as claimed in Claim 14 wherein the molten steel in the casting pool has an aluminum content on the order of 0.01% or less by weight.

17. The method of making steel strip as claimed in Claim

14 wherein: the molten steel in the casting pool has an oxygen content between 100 ppm and 250 ppm.

18. The method of making steel strip as claimed in Claim 14 wherein: the molten steel in the casting pool has an oxygen content between 100 ppm and 250 ppm.

19. The method of making steel strip as claimed in Claim 14 wherein the molten steel contains oxide inclusions comprising any one or more of MnO , SiO_2 and Al_2O_3 distributed through the steel at an inclusion density in the range 2 gm/cm³ to 4 gm/cm³.

20. The method of making steel strip as claimed in Claim 14 wherein more than a majority of the inclusions range in size between 2 and 12 microns.

21. The method of making steel strip as claimed in Claim 14 wherein the sulphur content of the molten steel is less than 0.01% by weight.

22. The method of making steel strip as claimed in Claim 14 comprising the additional steps of:

e. refining the molten steel prior to forming the casting pool by heating a steel charge and slag forming material to form molten steel covered by a slag containing silicon, manganese and calcium oxides,

f. stirring the molten steel by injecting an inert gas into molten steel to cause desulphurization, and thereafter

g. injecting oxygen to produce molten steel having the total oxygen content of greater than 70 ppm and a free oxygen content between 20 and 60 ppm.

23. The method of making steel strip as claimed in Claim 22 wherein the desulphurization reduces the sulphur content of the molten steel to less than 0.01% by weight.

24. The method of making a thin steel strip as claimed in Claim 22 wherein the solidified steel is a silicon/manganese killed steel and the inclusions comprise any one or more of MnO, SiO₂ and Al₂O₃.

5 25. The method of making a thin steel strip as claimed in Claim 22 wherein more than a majority of the inclusions range in size between 2 and 12 microns.

26. The method of making a steel strip as claimed in Claim 22 wherein the solidified steel has a total oxygen
10 content in the range of 100 ppm to 250 ppm.

27. A thin steel strip produced by twin roll casting to a thickness of less than 5mm and formed of a solidified steel containing solidified oxide inclusions distributed such that surface regions of the strip to a depth of 2 microns from the
15 surface contain such inclusions to a per unit area density of at least 120 inclusions/mm².

28. The thin steel strip as claimed in Claim 27 wherein the majority of the solidified steel is a silicon/manganese killed steel and the inclusions comprise any one or more of
20 MnO, SiO₂ and Al₂O₃.

29. The thin steel strip as claimed in Claim 27 wherein the majority of the inclusions range in size between 2 and 12 microns.

30. The thin steel strip as claimed in Claim 27 wherein
25 the solidified steel has an oxygen content reflective of total oxygen content in the range 100 ppm to 250 ppm and a free oxygen content between 30 and 50 ppm in the molten steel from which the strip is made.

31. The thin steel strip produced by twin roll casting
30 to a thickness of less than 5 mm and formed of a solidified steel containing oxide inclusions distributed to reflect a total oxygen content in the range 100 ppm to 250 ppm and free

oxygen content between 30 and 50 ppm in the made steel from which the strip is made.

32. The thin steel strip as claimed in Claim 31 wherein the majority of the solidified steel is a silicon/manganese killed steel and the inclusions comprise any one or more of MnO, SiO₂ and Al₂O₃.

33. The thin steel strip as claimed in Claim 31 wherein the majority of the inclusions range in size between 2 and 12 microns.

10 34. The thin steel strip as claimed in Claim 27 wherein the solidified steel has an oxygen content reflective of total oxygen content in the range 70 ppm to 250 ppm and a free oxygen content between 20 and 60 ppm in the molten steel from which the strip is made.

15 35. The thin steel strip produced by twin roll casting to a thickness of less than 5 mm and formed of a solidified steel containing oxide inclusions distributed to reflect a total oxygen content in the range 70 ppm to 250 ppm and free oxygen content between 20 and 60 ppm in the made steel from
20 which the strip is made.

36. The thin steel strip as claimed in Claim 35 wherein the majority of the solidified steel is a silicon/manganese killed steel and the inclusions comprise any one or more of MnO, SiO₂ and Al₂O₃.

25 37. The thin steel strip as claimed in Claim 35 wherein the majority of the inclusions range in size between 2 and 12 microns.